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OBSERVATIONS OF THE SUN, MOON, AND PLANETS SIX–INCH TRANSIT CIRCLE RESULTS

by

B. L. Klock and D. K. Scott

This *Circular* contains positions of the sun, moon, and planets observed with the Six–Inch Transit Circle between 30 June, 1968 and 17 July, 1969. These results are provisional. Definitive results will be published later in a volume of *Publications of the U. S. Naval Observatory*.

These results are a continuation of those published in *U. S. Naval Observatory Circular* No. 124.

The observed positions are geocentric and have received the usual corrections for instrumental errors, refraction, diurnal aberration, parallax, and orbital motion. The right ascensions were reduced, differentially, to the FK4 system by means of the FK4 stars used to determine the clock correction.

The declinations of the night objects have been reduced to the FK4 system by applying a correction derived from the same stars that were used for the clock correction.

The sun, Mercury, and Venus were reduced with the clock correction of the nearest night tour and the nadirs taken at the time of the observation. Corrections for day minus night differences are not available at this time.

Observations of Mercury and Venus were made on the illuminated limb or on the center of light as indicated, and reduced with the appropriate corrections to the center of the planet. Observations of the sun, Mars, Jupiter, and Saturn were made on both pairs of limbs; those of Mars and Jupiter have been corrected for defective illumination. The tabular semidiameters from the ephemeris have been used whenever a correction from limb to center or a correction for defective illumination has been applied. The moon observations were made on the illuminated limbs as

indicated and have been reduced with the tabular values of the semidiameter corrected for irradiation (*Pub. U.S. Naval Observatory*, XVI, 378) and with limb corrections from the charts of C. B. Watts (*Astro. Papers, Vol.* 17).

The computed positions with which the observed positions are compared were derived from the tabular values of the *American Ephemeris* for the instant when the ephemeris hour angle is zero on the meridian $5^h8^m15^s.849$ west longitude. No correction has been made for the difference between Ephemeris and Universal Time. The Julian Ephemeris Dates refer to the computed times of transit. The distances, in astronomical units, are those interpolated from the *American Ephemeris* at the computed time of transit. Brown's lunation numbers have been indicated for the moon. The lunar ephemeris has received differential corrections so that it is on the system $j = 2$ (*Trans. International Astronomical Union*, Vol. XIIIB, 49). The corrections for parallax in declination for the moon have been made using the IAU dimensions of the earth.

The observers are identified as follows:

A, D.A. Collins; B, R.L. Branham; C, H.E. Crull; D, H.E. Durgin; F, F.X. Ferrara;
G, F.S. Gauss; H, R.B. Hanson; J, E.S. Jackson; K, B.L. Klock; L, D.G. Hough;
M, D.E. McBride; P, E.J. Coyne; Q, D.W. Rivers; R, R.W. Rhynsburger; T, W.A. Toland;
U, J.A. Hughes; Y, T.F. Corbin; Z, F.J. Giovane.

The values of ΔT from the moon observations (lunation means) are listed in Table 1. The mean value of ΔT for 1968 is $37^s.25$ ($\pm^s.09$).

ΔT is computed by dividing (O–C) by 1.002738 times the variation per hour of longitude. The weights in right ascension are proportional to the square of 15 cos δ times the variation in right ascension per hour of longitude; those in declination are proportional to the square of the variation in declination per hour of longitude.

TABLE 1

Lun.	ΔT	P.E.	Lun.	ΔT	P.E.
	s	s		s	s
563	36.65	0.17	570	38.10	0.68
564	37.48	0.32	571	38.00	0.29
565	37.11	0.12	572	38.57	0.43
566	37.82	0.54	573	39.75	0.25
567	36.78	0.18	574	38.31	0.28
568	36.92	0.21	575	39.43	0.40
569	37.47	0.65			

Date	J.E.D.	O	L	Obs. R.A.	(O–C)	L	Obs. Decl.	(O–C)	Distance
	244			h m s	s		° ′ ″	″	
68 07 05.71	0043.21721	C		6 59 33.872	+.109		+22 44 21.28	-1.23	1.016716
68 07 07.71	0045.21744	R		7 07 46.658	+.113		+22 31 53.19	-0.19	1.016682
68 07 08.71	0046.21755	G		7 11 52.371	+.025		+22 25 03.30	-0.48	1.016660
68 07 09.71	0047.21765	Z		7 15			+22 17 50.63	-0.33	1.016634
68 07 11.71	0049.21784	D		7 24 07.299	+.076		+22 02 17.12	+0.40	1.016573
68 07 12.71	0050.21793	K		7 28 11.269	-.025		+21 53 55.02	-0.51	1.016538
68 07 16.71	0054.21822	M		7 44 22.985	+.090		+21 16 47.45	-0.15	1.016359
68 07 17.71	0055.21828	T		7 48 24.587	+.023		+21 06 36.62	+0.80	1.016304
68 07 19.71	0057.21838	T		7 56 27.529	+.180		+20 45 07.27	-0.77	1.016177
68 07 23.71	0061.21850	T		8 12 23.472	+.041		+19 58 01.26	-0.59	1.015863
68 07 24.71	0062.21852	M		8 16 21.350	+.080		+19 45		1.015770
68 07 29.71	0067.21849	C		8 36 01.706	+.236		+18 37 28.28	+0.30	1.015220
68 07 30.71	0068.21846	Z		8 39 55.762	+.103		+18 22 56.93	+0.41	1.015093
68 08 01.71	0070.21838	T		8 47 42.187	+.035		+17 52 59.82	-0.11	1.014826
68 08 06.71	0075.21807	R		9 06 57.602	+.087		+16 33 08.51	-0.65	1.014088
68 08 07.71	0076.21798	M		9 10 46.811	+.057		+16 16 21.69	-0.45	1.013932
68 08 11.71	0080.21758	R		9 25 57.997	+.141		+15 06 40.04	-0.62	1.013279
68 08 12.71	0081.21746	T		9 29 44.250	+.019		+14 48 38.75	+0.51	1.013109
68 08 13.71	0082.21734	M		9 33 30.108	+.042		+14 30 21.78	+0.14	1.012937
68 08 15.71	0084.21707	R		9 41 00.252	+.106		+13 53 07.11	+0.25	1.012581
68 08 17.71	0086.21678	R		9 48 28.298	+.095		+13 14 59.72	+1.02	1.012211
68 08 20.71	0089.21631	T		9 59 36.689	+.039		+12 16 11.37	-0.68	1.011626
68 08 21.71	0090.21614	G		10 03 18.581	+.052		+11 56 11.86	-0.76	1.011423
68 08 22.71	0091.21596	K		10 07 00.048	+.091		+11 36 00.73	-1.08	1.011215
68 08 23.71	0092.21578	M		10 10 41.035	+.094		+11 15 39.03	-0.88	1.011002
68 08 29.71	0098.21460	Z		10 32 38.233	+.041		+ 9 09 53.70	-1.87	1.009635
68 08 30.71	0099.21439	T		10 36 16.471	+.056		+ 8 48 25.47	-0.39	1.009393
68 09 03.71	0103.21351	C		10 50 46.160	+.090		+ 7 21 06.53	-0.71	1.008403
68 09 11.71	0111.21161	K		11 19 34.067	+.094		+ 4 21 10.25	-0.72	1.006362
68 09 12.71	0112.21137	T		11 23 09.371	+.042		+ 3 58 17.77	+0.46	1.006102
68 09 13.71	0113.21112	Z		11 26 44.653	+.037		+ 3 35 19.13	-0.12	1.005841
68 09 14.71	0114.21087	R		11 30 19.962	+.118		+ 3 12 15.60	-1.58	1.005578
68 09 15.71	0115.21063	R		11 33 55.091	+.047		+ 2 49 10.23	-1.21	1.005314
68 09 18.70	0118.20989	T		11 44 40.725	+.056		+ 1 39 34.93	-0.45	1.004509
68 09 19.70	0119.20964	Z		11 48 15.998	+.066		+ 1 16 17.68	-0.57	1.004237
68 09 20.70	0120.20940	C		11 51 51.313	+.049		+ 0 52 59.26	+0.08	1.003961
68 09 21.70	0121.20915	R		11 55 26.723	+.045		+ 0 29 38.42	-0.03	1.003684
68 09 22.70	0122.20891	R		11 59 02.251	+.075		+ 0 06 16.33	-0.21	1.003404
68 09 23.70	0123.20867	T		12 02 37.820	+.026		- 0 17 06.42	-0.13	1.003121
68 09 24.70	0124.20843	Z		12 06 13.583	+.032		- 0 40 29.84	-0.23	1.002836
68 09 25.70	0125.20819	C		12 09 49.529	+.076		- 1 03 52.77	+0.32	1.002548
68 09 26.70	0126.20795	R		12 13 25.539	+.011		- 1 27 17.26	-0.95	1.002259
68 09 27.70	0127.20772	T		12 17 01.877	+.095		- 1 50 39.41	-0.50	1.001968
68 09 28.70	0128.20749	R		12 20 38.319	+.073		- 2 14		1.001677
68 09 30.70	0130.20703	K		12 27 51.916	+.068		- 3 00 39.66	-0.14	1.001090
68 10 01.70	0131.20681	T		12 31 29.131	+.102		- 3 23 56.44	-0.33	1.000797
68 10 02.70	0132.20659	Z		12 35 06.563	+.077		- 3 47 10.72	-0.47	1.000505
68 10 04.70	0134.20616	Z		12 42 22.446	+.099		- 4 33 29.88	+0.21	0.999922
68 10 08.70	0138.20535	D		12 56 58.628	+.126		- 6 05 27.48	-0.79	0.998772
68 10 14.70	0144.20430	G		13 19 06.704	+.119		- 8 20 50.77	+2.51	0.997086
68 10 20.70	0150.20348	R		13 41 35.032	+.031		-10 32 10.98	+0.03	0.995428
68 10 21.70	0151.20337	C		13 45 21.998	+.029		-10 53 33.32	+0.41	0.995152
68 11 01.70	0162.20269	C		14 27			-14 36 27.91	+0.91	0.992159
68 11 20.70	0181.20417	D		15 44 48.613	+.121		-19 49 07.50	+1.08	0.987843
68 11 22.70	0183.20453	D		15 53 13.006	+.072		-20 15 13.69	+1.64	0.987448

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Date	J.E.D.	O	L	Obs. R.A.	(O–C)	L	Obs. Decl.	(O–C)	Distance
	244			h m s	s		° ′ ″	″	
68 11 23.70	0184.20473	R		15 57 26.368	+.037		-20 27 44.23	+0.96	0.987253
68 11 25.70	0186.20514	D		16 05 55.475	+.101		-20 51 35.37	+0.86	0.986873
68 11 26.70	0187.20536	K		16 10 11.060	+.079		-21 02 55.36	+1.34	0.986689
68 11 29.70	0190.20607	T		16 23 02.044	+.032		-21 34 33.45	+0.51	0.986159
68 12 06.70	0197.20798	G		16 53 23.458	+.092		-22 33		0.985102
68 12 09.70	0200.20889	R		17 06 32.299	+.138		-22 52 37.05	-1.08	0.984732
68 12 10.70	0201.20921	Z		17 10 56.151	+.139		-22 57 58.98	+0.09	0.984620
68 12 11.70	0202.20953	T		17 15 20.430	+.157		-23 02 52.49	+2.51	0.984514
68 12 12.70	0203.20985	Z		17 19 45.001	+.080		-23 07 22.50	+0.99	0.984412
68 12 19.71	0210.21222	T		17 50 45.777	+.095		-23 25 43.35	+0.49	0.983820
68 12 24.71	0215.21395	R		18 12 58.767	+.038		-23 24 42.72	+1.50	0.983507
69 01 01.71	0223.21665	R		18 48 25.493	+.115		-22 58 43.71	+0.13	0.983253
69 01 02.71	0224.21698	T		18 52			-22 53 23.61	+0.35	0.983248
69 01 16.72	0238.22094	Z		19 53 45.331	+.101		-20 52		0.983794
69 01 25.72	0247.22271	R		20 31 47.866	+.079		-18 52 47.24	+0.96	0.984592
69 01 26.72	0248.22287	R		20 35 57.498	+.074		-18 37 41.13	+1.10	0.984702
69 01 27.72	0249.22301	C		20 40 06.336	+.092		-18 22 13.76	+2.34	0.984816
69 02 10.72	0263.22400	T		21 36 43.707	+.039		-14 14 26.64	+1.95	0.986986
69 02 11.72	0264.22400	Z		21 40 40.476	+.048		-13 54 44.89	+1.47	0.987178
69 02 12.72	0265.22399	C		21 44 36.483	+.043		-13 34 49.49	+0.75	0.987372
69 02 14.72	0267.22395	T		21 52 26.339	+.094		-12 54 17.58	+0.44	0.987770
69 02 15.72	0268.22392	R		21 56 20.117	+.061		-12 33 41.89	+0.97	0.987972
69 02 17.72	0270.22383	G		22 04 05.514	+.003		-11 51 54.26	+2.34	0.988383
69 02 24.72	0277.22328	R		22 30 53.157	+.087		- 9 20 12.39	+0.42	0.989893
69 02 25.72	0278.22317	R		22 34 40.221	+.044		- 8 57 55.80	-0.02	0.990121
69 03 03.72	0284.22238	K		22 57 11.144	+.064		- 6 41		0.991555
69 03 04.72	0285.22222	C		23 00 54.526	+.057		- 6 18 36.82	+1.49	0.991808
69 03 05.72	0286.22207	G		23 04 37.426	+.019		- 5 55 29.29	-0.15	0.992064
69 03 12.72	0293.22085	R		23 30 27.596	+.131		- 3 11		0.993943
69 03 13.72	0294.22066	Z		23 34 07.679	+.023		- 2 47 49.04	+1.04	0.994220
69 03 14.72	0295.22047	K		23 37 47.708	+.108		- 2 24		0.994497
69 03 15.72	0296.22027	R		23 41 27.346	+.043		- 2 00		0.994776
69 03 16.72	0297.22007	R		23 45 06.923	+.143		- 1 36 44.87	+0.89	0.995054
69 03 17.71	0298.21987	C		23 48 46.138	+.088		- 1 13 01.33	+1.05	0.995333
69 03 19.71	0300.21947	A		23 56 04.133	+.081		- 0 25 35.21	-0.21	0.995889
69 03 22.71	0303.21885	R		0 07 00.018	+.030		+ 0 45 32.12	+0.37	0.996723
69 03 23.71	0304.21864	R		0 10 38.473	+.057		+ 1 09 11.94	+0.68	0.997002
69 03 28.71	0309.21758	C		0 28 49.846	+.055		+ 3 06 53.07	+0.69	0.998400
69 04 01.71	0313.21674	A		0 43 23.256	+.113		+ 4 39 56.49	+0.61	0.999535
69 04 03.71	0315.21633	C		0 50 40.409	+.014		+ 5 25 59.19	+0.53	1.000111
69 04 06.71	0318.21572	R		1 01 37.522	+.017		+ 6 34 19.01	-0.46	1.000984
69 04 08.71	0320.21533	Z		1 08 56.733	+.065		+ 7 19 20.43	-0.53	1.001569
69 04 09.71	0321.21514	C		1 12 36.744	+.105		+ 7 41 40.86	-0.05	1.001861
69 05 02.71	0344.21192	A		2 38 38.781	+.041		+15 28 17.65	-1.31	1.008062
69 05 03.71	0345.21185	R		2 42 28.884	+.091		+15 46 00.53	+0.60	1.008312
69 05 04.71	0346.21178	R		2 46 19.419	+.008		+16 03 25.38	-0.01	1.008561
69 05 05.71	0347.21172	A		2 50 10.618	+.008		+16 20 34.54	-0.43	1.008810
69 05 06.71	0348.21166	Z		2 54 02.430	+.048		+16 37 27.13	-1.28	1.009056
69 05 07.71	0349.21161	C		2 57 54.800	+.067		+16 54 04.67	-0.78	1.009301
69 05 10.71	0352.21151	Z		3 09 35.348	+.040		+17 42 14.49	-0.04	1.010018
69 05 12.71	0354.21147	A		3 17 25.405	+.086		+18 12 52.06	-0.50	1.010479
69 05 15.71	0357.21147	C		3 29 14.830	+.093		+18 56 31.77	+0.44	1.011140
69 05 16.71	0358.21148	A		3 33 12.415	+.049		+19 10		1.011352
69 05 17.71	0359.21150	R		3 37 10.617	+.049		+19 24 01.23	-0.30	1.011558
69 05 22.71	0364.21169	C		3 57 09.835	+.131		+20 26 55.59	-0.57	1.012524

SUN

Date	J.E.D.	O	L	Obs. R.A.	(O–C)	L	Obs. Decl.	(O–C)	Distance
	244			h m s	s		° ′ ″	″	
69 05 26.71	0368.21195	G		4 13 18.190	+.009		+21 10 57.69	-0.21	1.013223
69 05 27.71	0369.21203	C		4 17 21.491	+.005		+21 21 03.65	-0.26	1.013390
69 05 28.71	0370.21211	A		4 21 25.265	+.025		+21 30 47.28	-0.41	1.013553
69 05 29.71	0371.21220	K		4 25 29.493	+.049		+21 40		1.013712
69 05 30.71	0372.21229	Z		4 29 34.134	+.058		+21 49 07.68	-0.40	1.013870
69 05 31.71	0373.21239	R		4 33 39.201	+.064		+21 57 44.03	-0.32	1.014026
69 06 01.71	0374.21249	G		4 37 44.635	+.019		+22 05 56.90	-0.83	1.014179
69 06 02.71	0375.21260	G		4 41			+22 13 47.52	-0.58	1.014328
69 06 03.71	0376.21271	C		4 45 56.860	+.090		+22 21 14.68	-0.58	1.014476
69 06 04.71	0377.21283	D		4 50 03.557	+.151		+22 28 19.10	-0.03	1.014620
69 06 05.71	0378.21295	G		4 54 10.485	+.081		+22 35 00.41	+1.02	1.014761
69 06 06.71	0379.21307	L		4 58 17.897	+.155		+22 41 16.12	+0.09	1.014898
69 06 07.71	0380.21320	R		5 02 25.498	+.094		+22 47 08.99	+0.21	1.015032
69 06 08.71	0381.21333	R		5 06 33.454	+.088		+22 52 37.05	-0.46	1.015160
69 06 12.71	0385.21389	G		5 23 07.946	+.110		+23 10 29.56	-0.69	1.015623
69 06 13.71	0386.21403	Z		5 27 17.111	+.128		+23 13 56.82	-0.50	1.015725
69 06 20.71	0393.21509	C		5 56 24.082	+.087		+23 26 34.97	+0.05	1.016278
69 06 21.71	0394.21524	Z		6 00 33.747	+.084		+23 26 43.04	-0.84	1.016336
69 06 23.71	0396.21554	R		6 08 52.854	+.038		+23 25 46.75	-0.64	1.016434
69 06 24.71	0397.21569	Z		6 13 02.315	+.061		+23 24 41.16	-0.77	1.016478
69 06 26.71	0399.21598	Q		6 21 20.872	+.131		+23 21 15.84	-1.05	1.016550
69 06 28.71	0401.21626	R		6 29 38.632	+.057		+23 16 13.47	-0.11	1.016608
69 06 29.71	0402.21640	R		6 33 47.241	+.039		+23 13 04.86	-0.36	1.016633
69 06 30.71	0403.21654	R		6 37 55.659	+.058		+23 09 31.62	-0.97	1.016654
69 07 01.71	0404.21667	L		6 42 03.850	+.078		+23 05 34.80	-0.82	1.016672
69 07 02.71	0405.21681	D		6 46 11.763	+.079		+23 01 14.31	-0.19	1.016686
69 07 03.71	0406.21693	C		6 50 19.336	+.021		+22 56 28.72	-0.64	1.016697
69 07 04.71	0407.21706	R		6 54 26.725	+.065		+22 51 19.20	-0.94	1.016704
69 07 06.71	0409.21730	R		7 02 40.506	+.085		+22 39 49.38	-0.78	1.016704
69 07 14.71	0417.21807	C		7 35 20.270	+.064		+21 38 16.40	-1.40	1.016498
69 07 15.71	0418.21815	Q		7 39			+21 28 53.75	-0.69	1.016446
69 07 17.71	0420.21828	R		7 47 27.466	+.012		+21 09		1.016324

MERCURY

68 07 29.69	0067.19085	C		7 56		C	+21 45 50.35	-0.45	1.254523
68 08 01.70	0070.20091	T	C	8 22 28.211	+.097	C	+20 48 45.87	+0.51	1.297814
68 08 11.73	0080.23148	R	C	9 46 02.719	+.207	C	+15 18 29.22	-1.28	1.356613
68 08 12.73	0081.23405	T	C	9 53 41.575	+.222	C	+14 37 24.23	-0.93	1.356383
68 08 13.73	0082.23651	M	C	10 01 11.541	+.122		+13 55		1.355287
68 08 15.74	0084.24114	R	C	10 15 45.666	+.119	C	+12 29 17.03	-1.53	1.350722
68 08 21.75	0090.25278	G	C	10 56 13.283	+.098	C	+ 8 00 34.34	-1.26	1.321530
68 08 29.76	0098.26387	Z	C	11 43 46.250	+.038	C	+ 1 59 41.14	-1.93	1.256365
68 08 30.76	0099.26495	T	C	11 49 17.038	+.079	C	+ 1 15 32.62	-1.95	1.246580
68 09 12.77	0112.27391	T	C	12 53 28.267	+.089	C	- 7 33 38.66	-1.01	1.091855
68 09 13.77	0113.27420	K	C	12 57 49.322	+.026	C	- 8 09 40.21	-1.58	1.077953
68 09 18.77	0118.27454	T	C	13 18 02.121	+.018	C	-10 55 30.94	-1.30	1.004418
68 09 23.77	0123.27259	T	C	13 34 55.952	-.093	C	-13 11 31.71	-1.22	0.924874
68 10 04.75	0134.25362	Z	C	13 50 54.485	-.102	C	-15 13 31.92	-0.03	0.745443
68 11 20.67	0181.17841	D	C	15 07 36.216	+.139	C	-16 45 52.27	+0.01	1.371207
68 11 21.68	0182.18003	T	C	15 13 53.527	+.159	C	-17 18 06.87	-0.64	1.381125
68 11 22.68	0183.18168	D	C	15 20 12.702	+.112	C	-17 49 34.08	+0.82	1.390317
68 11 25.68	0186.18675	D	C	15 39 21.626	+.148	C	-19 19 04.59	-0.55	1.413724
68 12 24.74	0215.24467	R	C	18 57 20.167	+.198	C	-24 57 34.75	-0.97	1.358317
68 12 30.75	0221.25717	T		19 39		C	-23 39 51.55	+1.05	1.278736

MERCURY

Date	J.E.D.	O	L	Obs. R.A.	(O–C)	L	Obs. Decl.	(O–C)	Distance
	244			h m s	s		° ′ ″	″	
69 01 02.76	0224.26291	T		19 59		C	-22 40 29.40	+0.93	1.227824
69 01 16.77	0238.27303	Z	C	21 08 57.797	-.012		-16 13		0.893613
69 02 12.65	0265.15787	C		20 09		C	-18 02 13.04	-0.52	0.789172
69 02 14.65	0267.15467	T		20 12		C	-18 16 53.95	-0.89	0.821677
69 03 03.65	0284.15581	K	C	21 21 03.937	+.120	C	-16 44 51.93	+0.27	1.083032
69 03 04.65	0285.15676	C	C	21 26 23.171	+.089	C	-16 27 21.78	+1.65	1.096352
69 03 05.65	0286.15777	G	C	21 31 47.189	+.077	C	-16 08 35.22	+0.44	1.109405
69 03 16.67	0297.17171	R	C	22 35 16.584	+.167	C	-11 16 52.76	+1.04	1.234728
69 03 22.68	0303.18108	R	C	23 12 27.692	+.033	C	- 7 34 28.75	+0.91	1.287607
69 03 28.69	0309.19173	C	C	23 51 30.351	+.130	C	- 3 10 15.49	+0.09	1.326277
69 05 05.77	0347.27027	A	C	4 14 43.140	-.014	C	+23 53 29.85	+0.17	0.848441
69 07 13.68	0416.18720	Z	C	6 46 49.081	+.160	C	+23 30 11.62	+0.13	1.248768
69 07 16.69	0419.19801	Z	C	7 14 15.187	+.115	C	+23 19 38.29	-0.15	1.290559

VENUS

68 07 05.73	0043.23014	C	1	7 18 13.365	+.190		+23 05		1.728442
68 07 07.73	0045.23203	R	1	7 28 50.664	+.182	S	+22 48 32.76	-0.31	1.726430
68 07 11.73	0049.23572	D	1	7 49 56.212	+.132	N	+22 06 07.97	-0.35	1.721717
68 07 16.74	0054.24009	M	1	8 15 58.000	+.070	N	+20 58 40.80	-1.05	1.714546
68 07 17.74	0055.24093	T	1	8 21 07.451	+.149	N	+20 43 20.99	-0.95	1.712942
68 07 19.74	0057.24258	T	1	8 31 23.921	+.089		+20 10		1.709560
68 07 23.74	0061.24571	T	1	8 51 40.649	+.071	N	+18 59 13.57	-1.04	1.702113
68 07 29.75	0067.25001	C	1	9 21 32.194	+.005	N	+16 55 57.34	-1.84	1.689242
68 08 07.75	0076.25554	M	1	10 05 00.865	+.074		+13 20		1.666258
68 08 08.75	0077.25609	T	1	10 09 45.241	+.139	N	+12 54 45.66	-1.81	1.663448
68 08 11.75	0080.25768	R	1	10 23 52.057	+.104	N	+11 35 12.06	+0.03	1.654719
68 08 12.75	0081.25818	T	1	10 28 32.300	-.001	N	+11 08 00.99	-1.38	1.651711
68 08 15.75	0084.25964	R	1	10 42 28.012	+.008	N	+ 9 44 49.84	+0.10	1.642398
68 08 21.76	0090.26230	G	1	11 09 58.267	+.038	N	+ 6 51 43.23	-0.57	1.622480
68 08 22.76	0091.26272	K	1	11 14 30.944	+.033	N	+ 6 22 07.85	-1.46	1.618995
68 08 23.76	0092.26313	M	1	11 19 03.152	+.129	N	+ 5 52 21.82	-2.63	1.615462
68 08 29.76	0098.26548	Z	1	11 46 05.620	-.012	N	+ 2 50 56.64	+0.20	1.593300
68 08 30.76	0099.26585	T	1	11 50 34.790	+.031	N	+ 2 20 17.82	-0.98	1.589449
68 09 03.76	0103.26733	C	1	12 08 29.129	+.105		+ 0 17		1.573620
68 09 12.77	0112.27064	T	1	12 48 44.697	+.087	N	- 4 20 30.56	-1.56	1.535678
68 09 13.77	0113.27102	K	1	12 53 13.975	+.046	N	- 4 51 06.97	-0.53	1.531273
68 09 18.77	0118.27298	T	1	13 15 46.621	+.069	N	- 7 22 40.57	-1.14	1.508699
68 09 20.77	0120.27380	C	1	13 24 51.155	-.014	N	- 8 22 19.10	-0.13	1.499415
68 09 21.77	0121.27423	R	1	13 29 24.347	-.052	N	- 8 51 55.08	-1.68	1.494718
68 09 23.77	0123.27510	T	1	13 38 32.952	+.062	N	- 9 50 29.12	-1.53	1.485218
68 09 24.77	0124.27554	Z		13 43		N	-10 19 25.91	+0.02	1.480414
68 09 25.77	0125.27600	C	1	13 47 44.304	-.039	N	-10 48 11.91	-1.15	1.475574
68 09 27.77	0127.27694	T	1	13 56 59.178	+.169	N	-11 44 57.50	-0.93	1.465791
68 09 30.77	0130.27843	K	1	14 10 57.590	+.028	N	-13 08 04.44	-0.09	1.450863
68 10 01.77	0131.27895	T	1	14 15 39.008	+.065	N	-13 35 11.43	+0.12	1.445821
68 10 02.77	0132.27948	Z	1	14 20 21.394	+.099	N	-14 02 01.14	-1.45	1.440748
68 10 04.78	0134.28057	Z	1	14 29 49.110	+.057	N	-14 54 35.10	+0.89	1.430508
68 10 08.78	0138.28290	D	1	14 48 57.487	+.039	N	-16 35 26.84	+0.22	1.409671
68 10 21.79	0151.29198	C	1	15 53 19.560	+.023	N	-21 14 16.44	-0.77	1.338818
68 11 08.80	0169.30799	D		17 27		N	-24 58 00.76	+1.08	1.233123
68 11 21.82	0182.32063	T	1	18 36 54.349	+.113	S	-25 17 27.85	+2.30	1.152023
68 11 22.82	0183.32158	D	1	18 42 13.403	-.049	S	-25 13 48.64	-0.01	1.145623
68 11 25.82	0186.32440	D	1	18 58 07.294	+.032		-24 58		1.126285
68 11 26.82	0187.32532	K	1	19 03 23.738	+.068	S	-24 51 42.46	+1.16	1.119793
68 11 29.82	0190.32802	R		19 19		S	-24 27 36.03	+1.22	1.100186

VENUS

Date	J.E.D.	O	L	Obs. R.A.	(O–C)	L	Obs. Decl.	(O–C)	Distance
	244			h m s	s		° ′ ″	″	
68 12 05.83	0196.33307	Z	1	19 50 04.252	+.008		-23 20		1.060411
68 12 06.83	0197.33386	G	1	19 55 09.251	+.083	S	-23 07 19.19	+1.99	1.053714
68 12 09.83	0200.33613	R	1	20 10 15.310	+.075	S	-22 23 13.87	-0.30	1.033508
68 12 11.83	0202.33755	T	1	20 20 11.724	+.094	S	-21 50 45.15	+0.85	1.019946
68 12 12.83	0203.33823	Z	1	20 25 07.447	+.004	S	-21 33 39.22	+0.17	1.013137
68 12 24.84	0215.34491	R	1	21 22 04.419	+.001	S	-17 27 12.52	+1.35	0.929998
68 12 27.84	0218.34611	T	1	21 35 38.330	+.053	S	-16 15 18.67	+1.39	0.908796
68 12 30.84	0221.34712	T		21 48		S	-15 00 02.74	+0.76	0.887443
69 01 02.84	0224.34794	T		22 01		S	-13 41 45.32	+1.28	0.865951
69 01 16.84	0238.34927	Z	1	22 59 03.211	+.002		- 7 07		0.764166
69 01 25.84	0247.34800	R	1	23 32 42.490	-.011	S	- 2 40 04.41	+1.03	0.697690
69 01 26.84	0248.34776	R	1	23 36 17.674	-.041	S	- 2 10 16.16	+0.26	0.690268
69 02 11.84	0264.34057	Z	1	0 28 59.571	-.062	S	+ 5 34 30.93	+0.92	0.571714
69 02 14.83	0267.33843	T	1	0 37 44.344	-.022	S	+ 6 56 34.91	+0.34	0.549747
69 03 03.81	0284.31927	K	1	1 17 05.372	-.106	S	+13 39 33.74	+0.48	0.430088
69 03 04.81	0285.31764	R	1	1 18 41.210	-.129	S	+13 58 39.41	-1.02	0.423482
69 03 05.81	0286.31595	G	1	1 20 10.981	-.154	S	+14 17 06.30	-1.37	0.416948
69 03 12.80	0293.30191	R	1	1 27 30.572	-.233	S	+16 04 58.76	-2.29	0.373657
69 03 13.79	0294.29957	Z	1	1 28 03.684	-.271	S	+16 16 55.69	-2.47	0.367887
69 03 14.79	0295.29712	K	1	1 28 28.817	-.240	S	+16 27 54.78	-1.52	0.362238
69 03 16.79	0297.29196	R	1	1 28 54.200	-.163	S	+16 46 43.49	-1.88	0.351331
69 03 17.78	0298.28922	C	1	1 28 54.055	-.189	S	+16 54 28.69	-2.17	0.346086
69 03 19.78	0300.28346	A	1	1 28 27.552	-.254	S	+17 06 26.89	-2.94	0.336052
69 03 22.77	0303.27404	R	1	1 26 41.478	-.290	S	+17 14 55.54	-1.75	0.322262
69 03 23.77	0304.27070	R	1	1 25 48.512	-.261	S	+17 15 01.26	-2.36	0.318036
69 03 28.75	0309.25255	C	1	1 19 18.757	-.262	S	+16 53 42.30	-1.82	0.300087
69 04 01.73	0313.23657	A	1	1 12 00.447	-.296	S	+16 09 40.44	-2.82	0.290078
69 04 19.66	0331.16379	R	2	0 37 53.520	-.066	N	+ 9 47 00.56	-1.49	0.301784
69 05 02.62	0344.12670	A	2	0 35 35.515	-.003	N	+ 6 17 23.32	-1.82	0.361459
69 05 03.62	0345.12453	R	2	0 36 23.748	-.003	N	+ 6 08 42.08	-0.48	0.367300
69 05 04.62	0346.12244	R	2	0 37 19.573	-.037	N	+ 6 01 05.49	-0.29	0.373280
69 05 05.62	0347.12044	A	2	0 38 22.935	+.074	N	+ 5 54 33.09	-1.06	0.379392
69 05 06.61	0348.11853	Z	2	0 39 33.327	+.043	N	+ 5 49 05.94	-0.63	0.385629
69 05 07.61	0349.11669	C	2	0 40 50.663	+.034	N	+ 5 44 41.08	-0.55	0.391984
69 05 10.61	0352.11163	Z	2	0 45 21.947	+.065	N	+ 5 37 30.47	+1.00	0.411694
69 05 12.60	0354.10860	A	2	0 48 53.037	+.014	N	+ 5 37 27.35	+0.01	0.425314
69 05 15.60	0357.10454	C	2	0 54 50.724	+.062	N	+ 5 43 58.48	-0.13	0.446357
69 05 16.60	0358.10330	A	2	0 57 00.013	+.055	N	+ 5 47 47.45	+0.24	0.453517
69 05 17.60	0359.10212	R	2	0 59 13.986	+.017	N	+ 5 52 21.66	-0.27	0.460744
69 05 22.59	0364.09695	C	2	1 11 28.675	+.118	N	+ 6 25 49.34	+1.66	0.497757
69 05 26.59	0368.09360	G	2	1 22 24.703	+.078	N	+ 7 03 33.73	+0.28	0.528237
69 05 27.59	0369.09286	C	2	1 25 17.202	+.138	N	+ 7 14 21.40	+2.56	0.535956
69 05 28.59	0370.09215	A	2	1 28 12.793	+.135	N	+ 7 25 33.69	+0.73	0.543710
69 05 29.59	0371.09148	K	2	1 31 11.428	+.097	N	+ 7 37 13.98	-0.37	0.551496
69 05 31.59	0373.09025	R	2	1 37 17.586	+.074	N	+ 8 01 53.58	-0.13	0.567157
69 06 01.58	0374.08968	R	2	1 40 24.940	+.083	N	+ 8 14 48.99	+0.08	0.575027
69 06 04.58	0377.08816	D	2	1 50 03.191	+.200	N	+ 8 55 41.39	+0.36	0.598770
69 06 08.58	0381.08654	R	2	2 03 28.882	+.122	N	+ 9 54 16.22	+0.54	0.630654
69 06 24.58	0397.08394	Z	2	3 02 48.577	+.142	N	+14 10 55.84	+0.90	0.758987
69 06 25.58	0398.08396	Q	2	3 06 46.911	+.090	N	+14 27 05.60	+0.24	0.766991
69 06 29.58	0402.08425	R	2	3 22 57.961	+.129	N	+15 30 51.17	+1.25	0.798934
69 06 30.58	0403.08437	R	2	3 27 05.020	+.117	N	+15 46 28.08	+0.68	0.806897
69 07 02.58	0405.08467	D	2	3 35 24.295	+.154	N	+16 17 13.70	+0.12	0.822789
69 07 04.58	0407.08505	R	2	3 43 50.239	+.152	N	+16 47 15.78	+0.26	0.838628
69 07 06.58	0409.08551	R	2	3 52 22.751	+.136	N	+17 16 26.71	+0.55	0.854406
69 07 13.58	0416.08767	Z	2	4 23 06.336	+.162	N	+18 50 12.26	+0.82	0.909055
69 07 15.58	0418.08845	Q	2	4 32 06.516	+.151	N	+19 14 09.75	+0.62	0.924485

MARS

Date	J.E.D.	O	L	Obs. R.A.	(O–C)	L	Obs. Decl.	(O–C)	Distance
	244			h m s	s		° ′ ″	″	
69 05 01.31	0342.81523	B		17 01 54.275	+.121		-23 10 01.64	-0.02	0.604754
69 05 03.30	0344.80939	K		17 01 20.814	+.042		-23 14 48.95	+0.59	0.592796
69 05 04.30	0345.80641	A		17 00			-23 17 11.39	-0.62	0.587002
69 05 05.30	0346.80339	C		17 00 34.233	+.002		-23 19 29.83	-0.06	0.581335
69 05 06.30	0347.80033	A		17 00 06.046	+.063		-23 21 46.49	+0.12	0.575796
69 05 13.27	0354.77787	A		16 55 15.855	+.006		-23 36 25.84	-0.27	0.540868
69 05 16.26	0357.76769	J		16 52 24.047	+.049		-23 41 48.50	-0.08	0.528104
69 05 22.24	0363.74649	J		16 45 26.207	+.005		-23 50 28.22	-0.99	0.506877
69 05 23.24	0364.74286	C		16 44 08.398	+.041		-23 51 35.01	-0.02	0.503916
69 05 27.22	0368.72814	U		16 38 38.852	-.010		-23 55 07.13	-0.56	0.493763
69 05 29.22	0370.72068	P		16 35 45.656	+.014		-23 56 15.19	+0.21	0.489707
69 05 30.21	0371.71693	B		16 34 17.511	-.011		-23 56 41.51	-0.93	0.487936
69 05 31.21	0372.71317	Z		16 32 48.569	-.077		-23 56 59.33	+0.31	0.486334
69 06 01.20	0373.70941	F		16 31			-23 57 12.60	-0.21	0.484902
69 06 07.18	0379.68681	L		16 22 20.676	+.099		-23 56 28.52	-0.50	0.479875
69 06 20.13	0392.63956	G		16 05 22.191	+.020		-23 47 34.10	-0.60	0.489088
69 06 22.13	0394.63271	B		16 03			-23 46 07.67	-0.12	0.492727
69 06 26.11	0398.61945	Q		15 59 59.578	+.018		-23 43 49.82	+0.01	0.501553
69 06 29.10	0401.60992	L		15 58 03.560	-.003		-23 42 49.03	0.00	0.509418
69 07 01.10	0403.60377	Q		15 57 03.863	+.084		-23 42 33.50	-0.08	0.515206

JUPITER

69 02 11.33	0263.83698	T		12 21 50.855	-.022		- 0 44 42.82	-1.44	4.678988
69 02 12.33	0264.83408	J		12 21 36.156	+.001		- 0 42		4.668121
69 02 13.33	0265.83118	C		12 21 20.805	-.008		- 0 40		4.657476
69 02 14.32	0266.82826	Z		12 21 04.882	+.025		- 0 38 59.09	-0.88	4.647057
69 02 27.28	0279.78979	J		12 16 46.702	-.048		- 0 08 16.80	-0.08	4.534091
69 03 05.27	0285.77172	C		12 14			+ 0 08 26.65	-0.58	4.497282
69 03 11.25	0291.75352	B		12 11 43.421	-.039		+ 0 26 16.62	+0.02	4.470907
69 03 12.25	0292.75048	J		12 11 16.237	-.036		+ 0 29 18.53	-0.86	4.467556
69 03 18.23	0298.73217	G		12 08 29.247	-.096		+ 0 47 52.22	-0.15	4.453878
69 03 22.21	0302.71994	K		12 06 35.901	-.070		+ 1 00 18.63	-0.89	4.450945
69 03 23.21	0303.71688	G		12 06 07.538	-.030		+ 1 03 24.94	-0.66	4.450986
69 03 29.19	0309.69854	C		12 03 18.160	-.034		+ 1 21 44.81	-1.29	4.457699
69 04 01.18	0312.68939	C		12 01 55.004	-.030		+ 1 30 39.34	-1.21	4.465158
69 04 02.18	0313.68634	A		12 01 27.594	-.073		+ 1 33		4.468243
69 04 04.18	0315.68026	B		12 00 33.529	-.044		+ 1 39 19.80	-0.33	4.475299
69 04 07.17	0318.67115	A		11 59 14.281	-.032		+ 1 47 40.98	-0.75	4.488076
69 04 08.16	0319.66812	R		11 58 48.407	-.054		+ 1 50 23.85	-0.59	4.492913
69 04 09.16	0320.66510	Z		11 58 22.869	-.051		+ 1 53 05.16	+0.42	4.498035
69 04 12.15	0323.65605	Z		11 57 08.222	-.089		+ 2 00 49.74	-0.52	4.515091
69 04 21.12	0332.62914	G		11 53			+ 2 21 24.40	+0.06	4.580843
69 05 01.09	0342.59981	Z		11 50 50.224	-.071		+ 2 38 33.43	-0.27	4.677046
69 05 02.09	0343.59691	L		11 50 35.822	-.005		+ 2 39		4.687858

SATURN

68 08 31.33	0099.83806	J		1 36 48.425	+.014		+ 7 11 35.20	+1.08	8.631077
68 09 03.32	0102.82954	T		1 36 20.627	-.010		+ 7 08 10.39	+0.42	8.595672
68 09 04.32	0103.82670	J		1 36			+ 7 06 58.92	+0.49	8.584286
68 09 08.31	0107.81528	T		1 35 27.778	+.032		+ 7 01 56.15	+0.66	8.540906
68 09 09.31	0108.81242	Z		1 35 16.256	+.034		+ 7 00 36.51	+0.79	8.530621

SATURN

Date	J.E.D.	O	L	Obs. R.A.	(O–C)	L	Obs. Decl.	(O–C)	Distance
	244			h m s	s		° ′ ″	″	
68 09 12.30	0111.80381	K		1 34 39.856	-.012		+ 6 56 28.28	+0.94	8.501166
68 09 13.30	0112.80093	T		1 34 27.160	-.014		+ 6 55 02.45	+0.78	8.491827
68 09 14.29	0113.79805	Z		1 34 14.223	+.022		+ 6 53 35.11	+0.51	8.482734
68 09 16.29	0115.79228	D		1 33 47.455	+.015		+ 6 50		8.465298
68 09 22.27	0121.77490	J		1 32 21.040	-.024		+ 6 41 12.76	-0.05	8.419242
68 09 25.26	0124.76618	Z		1 31 34.802	-.022		+ 6 36 17.94	+1.15	8.399892
68 09 28.25	0127.75743	J		1 30 46.851	-.038		+ 6 31 14.60	+1.16	8.383090
68 09 29.25	0128.75451	B		1 30 30.602	+.030		+ 6 29		8.378066
68 09 30.25	0129.75159	Y		1 30 14.119	+.023		+ 6 27 47.95	+0.06	8.373332
68 10 02.24	0131.74574	B		1 29 40.682	-.024		+ 6 24 21.51	+1.41	8.364743
68 10 05.23	0134.73696	Y		1 28 49.654	+.010		+ 6 19 06.00	+0.99	8.354078
68 10 21.19	0150.69002	B		1 24 07.623	-.014		+ 5 50 57.20	+0.72	8.343300
68 10 22.18	0151.68709	C		1 23 50.022	+.018		+ 5 49		8.345244
68 10 31.16	0160.66073	Z		1 21 15.279	+.007		+ 5 34 28.14	+0.24	8.376472
68 11 01.15	0161.65781	Z		1 20 58.677	-.003		+ 5 32 54.97	+0.23	8.381439
68 11 02.15	0162.65489	R		1 20 42.182	-.061		+ 5 31 22.94	+0.13	8.386698
68 11 03.15	0163.65197	T		1 20 25.954	-.016		+ 5 29 52.84	+0.67	8.392249
68 11 14.12	0174.62002	B		1 17			+ 5 14 55.60	+0.86	8.471867

URANUS

69 02 05.34	0257.84836	T		12 14 37.224	-.067		- 0 44		17.619835
69 02 11.33	0263.83157	T		12 14 02.190	-.048		- 0 41 00.50	-0.07	17.547574
69 02 12.32	0264.82877	J		12 13 55.761	-.093		- 0 40		17.536315
69 02 13.32	0265.82596	C		12 13 49.265	-.056		- 0 39 33.02	+0.14	17.525291
69 02 14.32	0266.82316	Z		12 13 42.618	-.022		- 0 38 48.78	-0.64	17.514501
69 02 27.28	0279.78652	J		12 12 03.732	-.066		- 0 27 48.84	-0.21	17.397586
69 03 05.26	0285.76954	C		12 11 12.081	-.047		- 0 22 07.59	-0.01	17.359223
69 03 13.24	0293.74686	F		12 09 59.165	-.034		- 0 14 08.85	+0.45	17.324389
69 03 23.21	0303.71846	G		12 08 24.338	-.053		- 0 03 52.29	-0.07	17.308040
69 03 29.20	0309.70142	C		12 07 27.229	-.060		+ 0 02 16.62	-0.26	17.312900
69 03 31.19	0311.69574	A		12 07 08.362	-.045		+ 0 04 18.53	+0.02	17.316938
69 04 01.19	0312.69290	C		12 06 58.933	-.079		+ 0 05 18.61	-0.34	17.319401
69 04 02.19	0313.69006	A		12 06			+ 0 06 19.04	-0.05	17.322170
69 04 04.18	0315.68439	B		12 06 30.979	-.088		+ 0 08 18.53	+0.14	17.328582
69 04 07.17	0318.67588	A		12 06 03.606	+.019		+ 0 11 14.66	+0.29	17.340407
69 04 08.17	0319.67304	R		12 05 54.470	-.078		+ 0 12 12.92	+0.78	17.344926
69 04 09.17	0320.67021	Z		12 05 45.478	-.096		+ 0 13 09.88	+0.41	17.349741
69 04 12.16	0323.66171	Z		12 05 18.962	-.096		+ 0 15 58.41	-0.04	17.365889
69 04 13.15	0324.65888	A		12 05 10.294	-.072		+ 0 16 52.75	-0.98	17.371836
69 04 21.13	0332.63627	G		12 04 04.163	-.013		+ 0 23 52.93	+0.33	17.429314
69 05 01.10	0342.60813	Z		12 02 51.672	-.062		+ 0 31 25.37	+0.10	17.524145

NEPTUNE

68 06 30.08	0037.58619	J		15 28 40.615	-.338		-17 05 24.31	+1.39	29.587310
69 03 31.34	0311.84766	J		15 46 29.873	-.295		-18 07 08.25	+1.98	29.646192
69 04 01.34	0312.84488	F		15 46 25.955	-.331		-18 06 53.95	+1.29	29.633430
69 04 12.31	0323.81428	J		15 45 36.702	-.324		-18 03 49.76	+1.53	29.507134
69 04 13.31	0324.81149	F		15 45 31.671	-.310		-18 03 31.26	+1.76	29.497029
69 05 01.26	0342.76115	B		15 43 48.578	-.259		-17 57 29.76	+1.40	29.359238
69 05 03.25	0344.75555	K		15 43 35.960	-.301		-17 56 46.78	+1.38	29.349379
69 05 05.24	0346.74994	C		15 43 23.232	-.313		-17 56 02.69	+2.23	29.340658
69 05 06.24	0347.74713	A		15 43 16.826	-.309		-17 55 42.25	+0.98	29.336723
69 05 10.23	0351.73591	J		15 42 50.854	-.316		-17 54 14.45	+1.58	29.323877

NEPTUNE

Date	J.E.D.	O	L	Obs. R.A.	(O–C)	L	Obs. Decl.	(O–C)	Distance
	244			h m s	s		° ′ ″	″	
69 05 12.23	0353.73030	F		15 42 37.732	-.293		-17 53 31.04	+1.09	29.319199
69 05 13.22	0354.72749	A		15 42 31.133	-.291		-17 53 08.21	+1.93	29.317291
69 05 18.21	0359.71346	L		15 41 58.016	-.272		-17 51 18.66	+1.69	29.312212
69 05 22.20	0363.70223	J		15 41 31.420	-.335		-17 49 52.06	+1.45	29.313457
69 05 28.18	0369.68539	F		15 40 51.898	-.324		-17 47 44.25	+1.41	29.324086
69 05 29.18	0370.68259	A		15 40 45.391	-.313		-17 47 23.18	+1.52	29.326870
69 05 30.17	0371.67978	K		15 40 38.920	-.296		-17 47 01.25	+2.62	29.329935
69 06 01.17	0373.67417	F		15 40 26.014	-.324		-17 46 21.22	+1.50	29.336925
69 06 06.16	0378.66015	G		15 39 54.452	-.293		-17 44 41.27	+1.70	29.359318
69 06 20.12	0392.62098	G		15 38 32.674	-.274		-17 40 31.27	+0.46	29.458052
69 06 26.10	0398.60424	Q		15 38 01.748	-.276		-17 38 59.50	+1.17	29.515493

CERES

69 06 07.38	0379.88353	L		21 06 23.779	+.061		-24 52 36.17	+1.45	2.243874
69 06 29.32	0401.82009	F		21 01 32.032	+.088		-26 57 21.79	+0.86	2.049290
69 06 30.31	0402.81701	G		21 01 02.003	+.083		-27 03 51.70	+1.91	2.042652
69 07 02.31	0404.81081	L		20 59 57.808	+.043		-27 17 01.42	+1.14	2.030037
69 07 14.27	0416.77240	B		20 51 48.409	+.088		-28 36 53.47	+2.09	1.974288
69 07 16.26	0418.76582	L		20 50 11.979	+.090		-28 49 55.63	+1.66	1.968545
69 07 17.26	0419.76252	Z		20 49 22.456	+.058		-28 56 21.89	+1.72	1.966071

VESTA

68 08 15.41	0083.91165	C		2 19 59.763	+.055		+ 4 24 17.14	+0.31	1.928354
68 08 22.39	0090.89468	G		2 23 05.650	+.068		+ 4 15 05.34	+1.25	1.854300
68 08 31.37	0099.87159	J		2 25 13.849	+.089		+ 3 53 23.43	+0.95	1.764853
68 09 03.36	0102.86355	T		2 25 27.239	+.080		+ 3 43 48.01	+0.46	1.736909
68 09 04.36	0103.86084	J		2 25 28.360	+.086		+ 3 40 21.94	+0.95	1.727834
68 09 07.35	0106.85257	D		2 25 21.492	+.080		+ 3 29		1.701377
68 09 08.34	0107.84977	T		2 25 15.812	+.111		+ 3 25 23.06	+0.77	1.692828
68 09 09.34	0108.84695	Z		2 25 08.349	+.080		+ 3 21 20.75	+0.58	1.684419
68 09 12.33	0111.83839	K		2 24 35.719	+.091		+ 3 08 34.66	+0.97	1.660082
68 09 13.33	0112.83549	T		2 24 21.380	+.089		+ 3 04 06.43	+0.98	1.652279
68 09 14.33	0113.83257	Z		2 24 05.321	+.103		+ 2 59 31.98	+0.85	1.644639
68 09 16.32	0115.82668	D		2 23 28.002	+.083		+ 2 50 05.44	+0.44	1.629863
68 09 20.31	0119.81466	Z		2 21 52.853	+.071		+ 2 30 09.81	+0.66	1.602457
68 09 22.30	0121.80854	J		2 20 55.238	+.070		+ 2 19 44.70	+1.20	1.589899
68 09 25.29	0124.79921	Z		2 19 16.780	+.096		+ 2 03 38.33	+0.98	1.572595
68 09 28.28	0127.78972	J		2 17 24.555	+.081		+ 1 47 07.63	+1.14	1.557227
68 09 29.28	0128.78653	B		2 16 44.275	+.091		+ 1 41 33.76	+1.33	1.552552
68 09 30.28	0129.78331	Y		2 16 02.619	+.113		+ 1 35 58.10	+1.02	1.548106
68 10 05.26	0134.76704	Y		2 12 14.984	+.099		+ 1 07 55.27	+1.25	1.529424
68 10 21.21	0150.71321	B		1 57 36.746	+.083		- 0 14 49.52	+0.84	1.512562
68 10 22.20	0151.70981	C		1 56 38.234	+.109		- 0 19 13.04	+0.30	1.513802
68 10 31.17	0160.67926	Z		1 48 00.624	+.104		- 0 51 57.02	+0.80	1.537239
68 11 01.17	0161.67589	Z		1 47 05.372	+.056		- 0 54 45.09	+1.03	1.541184
68 11 02.17	0162.67253	R		1 46 10.849	+.043		- 0 57 22.58	+1.02	1.545390
68 11 14.13	0174.63308	B		1 36 31.391	+.077		- 1 13 58.90	+0.30	1.615375
68 11 20.11	0180.61412	T		1 32 48.804	+.077		- 1 11 33.67	+0.74	1.662888
68 11 23.10	0183.60488	J		1 31 17.700	+.087		- 1 07 39.96	+0.85	1.689443
68 11 26.09	0186.59580	D		1 30 00.846	+.094		- 1 02 01.59	+0.89	1.717710
68 12 06.06	0196.56676	Y		1 27 30.238	+.074		- 0 31 28.97	+1.30	1.822737
68 12 09.05	0199.55841	J		1 27 16.756	+.081		- 0 19 04.65	+1.63	1.857056

VESTA

Date	J.E.D.	O	L	Obs. R.A.	(O–C)	L	Obs. Decl.	(O–C)	Distance
	244			h m s	s		° ′ ″	″	
68 12 11.05	0201.55294	Z		1 27 15.709	+.044		− 0 10 03.96	+0.92	1.880558
68 12 18.03	0208.53435	D		1 28 01.339	+.081		+ 0 25 56.43	+0.24	1.966273
68 12 24.01	0214.51910	K		1 29 39.207	+.092		+ 1 01 48.76	+1.70	2.043272
68 12 29.00	0219.50684	Z		1 31 39.586	+.048		+ 1 34 41.29	+0.88	2.109279
68 12 30.00	0220.50443	Z		1 32 07.717	+.079		+ 1 41 33.67	+0.82	2.122640
69 01 01.99	0223.49693	G		1 33 39.781	+.111		+ 2 02 43.72	+1.64	2.162974
69 01 04.99	0226.49030	F		1 35			+ 2 24 37.83	+0.95	2.203647
69 01 07.98	0229.48343	Z		1 37			+ 2 47 13.92	+1.13	2.244571
69 01 14.96	0236.46783	T		1 42 21.901	+.057		+ 3 42		2.340667
69 01 16.96	0238.46349	Z		1 43 58.655	+.092		+ 3 58		2.368184
69 01 26.94	0248.44244	R		1 53			+ 5 22 42.01	+0.38	2.505144

MOON

Lun.	Date	J.E.D.	O	L	Obs. R.A.	(O–C)	L	Obs. Decl.	(O–C)
		244			h m s	s		° ′ ″	″
563	68 07 06.04	0043.54694	C	1	14 55 41.857	1.539	N	-19 36 03.52	-6.57
	68 07 07.08	0044.58763	C	1	15 58 23.822	1.684	N	-24 20 12.50	-4.56
	68 07 08.13	0045.63177	R	1	17 06 04.348	1.805		-27 23	
	68 07 13.34	0050.83991	K	2	22 26 19.041	1.335	N	-13 14 26.14	+9.24
	68 07 15.40	0052.90160	D	2	0 03 17.035	1.217	N	- 0 51 27.15	+8.65
564	68 08 07.17	0075.67146	H	1	20 01 39.650	1.653	S	-25 29 20.71	+5.29
	68 08 08.21	0076.71172	M	1	21 03 44.142	1.601	S	-21 19 49.39	+8.65
	68 08 09.24	0077.74840	T	2	22 00 38.166	1.392		-15 58	
	68 08 12.34	0080.84258	Z	2	0 28 27.092	1.184	N	+ 2 46 18.25	+9.47
	68 08 13.37	0081.87162	T	2	1 14 19.498	1.200	N	+ 8 48 38.50	+9.44
565	68 09 07.22	0106.72429	D	2	23 20 09.650	1.244	S	- 6 21 45.96	+9.73
	68 09 08.25	0107.75444	T	2	0 07 38.177	1.225	N	+ 0 02 27.46	+9.48
	68 09 09.28	0108.78381	Z	2	0 53 58.936	1.202	N	+ 6 17 42.88	+9.17
	68 09 12.37	0111.87455	K	2	3 16 50.291	1.348	N	+21 53 16.40	+5.55
	68 09 13.40	0112.90745	T	2	4 08 17.024	1.382	N	+25 21 45.22	+3.26
	68 09 14.44	0113.94197	Z	2	5 02 04.469	1.399	N	+27 39 40.75	+2.53
566	68 09 29.99	0129.49312	R	1	19 17 02.745	1.767	S	-27 32 58.30	+3.82
	68 10 01.03	0130.53384	K	1	20 19 46.871	1.606	S	-24 36 27.82	+6.17
	68 10 02.07	0131.57139	T	1	21 17 56.435	1.523	S	-20 13 19.05	+8.54
	68 10 03.10	0132.60581	Z	1	22 11 35.466	1.288	S	-14 49 15.42	+7.96
	68 10 05.16	0134.66787	C	1	23 49 04.320	1.160	S	- 2 29 46.41	+10.39
567	68 10 31.05	0160.55333	Z	1	22 46 11.508	1.267	S	-10 41 23.68	+7.88
	68 11 01.08	0161.58350	Z	1	23 33 42.607	1.215	S	- 4 32 12.01	+9.17
	68 11 02.11	0162.61252	R	1	0 19 33.222	1.158	S	+ 1 41 15.33	+9.58
	68 11 03.14	0163.64124	T	1	1 04 57.546	1.204	S	+ 7 44 48.59	+8.66
568	68 11 25.93	0186.43474	C	1	21 37 28.667	1.433	S	-18 08 50.95	+8.76
	68 11 26.96	0187.46855	K	1	22 30 13.706	1.298	S	-12 25 24.49	+8.15
	68 12 06.24	0196.74967	Z	2	5 51 38.351	1.389	N	+28 23 33.70	-0.70
	68 12 09.35	0199.85471	T	2	8 35 08.068	1.329	S	+23 14 07.97	-6.14
	68 12 10.38	0200.88714	C	2	9 25 54.512	1.306		+19 05	
	68 12 12.44	0202.94849	T	2	11 02 22.647	1.190	S	+ 8 16 44.82	-10.68
569	68 12 29.03	0219.53139	Z	1	2 07 07.739	1.239	S	+15 32 08.56	+6.95
	68 12 30.06	0220.56194	Z	1	2 55 10.958	1.330	S	+20 14 20.78	+6.71
	69 01 02.16	0223.66317	G		5 33		N	+28 12 57.00	+0.13
	69 01 03.19	0224.69910	T		6 28		N	+28 15 59.64	-1.92
	69 01 04.23	0225.73478	Z		7 24		N	+26 53 54.21	-1.98
	69 01 05.26	0226.76936	D		8 18		N	+24 11 37.84	-5.57
	69 01 06.30	0227.80239	T		9 09		S	+20 19 22.81	-6.29
570	69 01 27.00	0248.50759	R		3 27		S	+23 01 44.74	+5.22
	69 01 28.04	0249.54098	C	1	4 19 15.954	1.370		+26 08	
	69 02 05.31	0257.80988	T	2	11 19 04.296	1.245		+ 5 37	
	69 02 06.34	0258.83976	C	2	12 06 09.591	1.222	S	- 0 44 48.30	-8.87
	69 02 10.47	0262.97504	R	2	15 37 16.958	1.748	S	-23 51 26.17	-6.92
571	69 02 24.98	0277.48719	R	1	4 51 59.297	1.420		+27 36	
	69 02 26.02	0278.52280	R	1	5 47 20.498	1.395	N	+28 38 23.90	-0.17
	69 02 28.09	0280.59422	R	1	7 38 21.336	1.463	N	+26 27 44.84	-4.84
	69 03 03.19	0283.69330	G	1	10 13 14.747	1.268	N	+13 50 06.16	-9.46
	69 03 04.22	0284.72404	K	2	11 01 34.740	1.242	N	+ 7 53 02.23	-10.87
	69 03 05.25	0285.75445	C	2	11 49 26.086	1.261	S	+ 1 28 11.85	-10.42
	69 03 10.42	0290.92892	R	2	16 21 04.215	1.750	S	-26 26 51.96	-5.80
572	69 03 28.03	0308.53930	A	1	8 09 26.510	1.403	N	+24 51 08.93	-6.30
	69 03 29.07	0309.57261	C	1	9 01 29.119	1.270	N	+21 04 24.19	-7.30
	69 03 31.13	0311.63565	A	1	10 40 23.769	1.212	N	+10 35 32.67	-10.22
	69 04 01.16	0312.66629	C	1	11 28 34.651	1.201	N	+ 4 18 45.63	-11.27
	69 04 02.19	0313.69726	A	1	12 17 15.079	1.338	N	- 2 19 40.81	-11.62
	69 04 07.38	0318.88377	A	2	17 06 16.996	1.869		-28 01	
	69 04 08.42	0319.92799	R	2	18 14 04.683	1.918	S	-28 39 13.68	-0.47

MOON

Lun.	Date	J.E.D.	O	L	Obs. R.A.	(O–C)	L	Obs. Decl.	(O–C)
		244			h m s	s		° ′ ″	″
573	69 05 01.17	0342.67217	Z	1	13 35 21.078	1.519	N	-12 27 13.05	-9.82
	69 05 02.20	0343.70850	L	1	14 31 45.303	1.691		-18 33	
	69 05 03.24	0344.74837	K	2	15 33 15.986	1.789	S	-23 37 40.50	-7.66
	69 05 04.29	0345.79165	A	2	16 39 43.053	1.900	S	-27 06 53.69	-5.54
	69 05 05.33	0346.83708	C	2	17 49 15.157	1.956	S	-28 33 17.27	-0.88
	69 05 06.38	0347.88239	A	2	18 58 36.943	1.842		-27 46	
	69 05 07.42	0348.92536	Z	2	20 04 36.606	1.692	N	-24 57 35.26	+5.79
574	69 05 26.01	0367.51827	A	1	11 31 41.985	1.278	N	+ 3 36 52.68	-11.20
	69 05 27.04	0368.54841	G	1	12 19 09.457	1.273	N	- 2 48 41.36	-11.58
	69 05 28.08	0369.58016	C	1	13 08 56.657	1.357	N	- 9 20 31.78	-10.81
	69 05 29.11	0370.61458	A	1	14 02 35.144	1.489	N	-15 38 29.37	-9.52
	69 05 30.15	0371.65263	K	1	15 01 28.147	1.562		-21 14	
	69 05 31.19	0372.69478	Z	1	16 06 16.741	1.836	S	-25 35 22.20	-5.25
	69 06 01.24	0373.74040	L	2	17 16 06.383	1.900		-28 03	
575	69 06 26.05	0398.55831	R	1	14 31 43.879	1.612	N	-18 47 04.90	-8.22
	69 06 27.09	0399.59761	R	1	15 32 25.660	1.782	N	-23 41 11.62	-6.32
	69 06 29.18	0401.68789	L	1	17 50 40.661	1.884		-28 26	
	69 06 30.23	0402.73526	G	2	19 03 01.493	1.957	S	-27 24 29.09	+4.25
	69 07 01.28	0403.78051	K	2	20 12 17.434	1.784	S	-24 09 00.22	+6.52
	69 07 02.32	0404.82193	L	2	21 16 02.963	1.787	N	-19 09 54.94	+9.99
	69 07 04.39	0406.89340	C	2	23 07 07.955	1.444	N	- 6 28 57.99	+10.25